Appendix A - Chesapeake Bay Preservation

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The City of Fairfax recognizes the importance of preserving its valuable water resources for future generations and the need to take steps to protect them from the adverse effects of pollution generated by urban land uses. The City of Fairfax also recognizes that land use activities adversely affecting City streams also adversely impact the health and viability of downstream resources, the most important of which is the Chesapeake Bay. The Chesapeake Bay is an important economic, social, and ecological resource whose continued health is of benefit to all citizens of the Commonwealth.

The City of Fairfax has a vested interest and a responsibility to protect local waterways from further degradation as a result of development. In addition, steps must be taken to improve currently degraded resources to ensure the long-term health of both the City's resources and the Chesapeake Bay. The City has risen to the challenge of natural resources and water quality protection and is committed to the implementation of the Chesapeake Bay Preservation Area Designation and Management Regulations as manifest by the Chesapeake Bay Preservation Act of 1988. These regulations apply to all localities within Tidewater Virginia; however, it is the individual jurisdictions that are responsible for identifying and implementing Chesapeake Bay preservation strategies. Map 1 presents Tidewater Virginia and a location map of the City.

The City of Fairfax, in its *2020* Commission Report, recognizes that government and citizens alike have a responsibility to exercise considerable care in promoting a healthy and sustainable environment and outlines a "vision" for the protection of the City's natural resources.

> *"Fairfax should be a City in which human activities are integrated into the natural environment in such a way that both are accommodated. It should be a City in which the residents have clean air to breathe and clean water to drink; in which residents are not exposed to undue risk from pollutants and other environmental hazards; and in which residents have the opportunity to enjoy their natural surroundings."*
>
> - Fairfax 2020 Commission Report
> "Tradition with Vision"

The City has made progress towards the goal of maintaining and promoting a healthy environment; nonetheless, significant environmental issues still need to be addressed. This Chesapeake Bay Preservation component to the City's Comprehensive Plan has been prepared to serve as a planning tool for the City Council, the Planning Commission, City agencies, and citizens to help guide the City in its protection of the Chesapeake Bay and the natural resources of the City.

Map APA-1

Tidewater Virginia and the City of Fairfax Location Map

1. Introduction, Purpose and Legal Authority

Recognizing the economic and social importance of ensuring the long term viability of State waters, and in particular the Chesapeake Bay and its tributaries, the Virginia General Assembly enacted the Chesapeake Bay Preservation Act of 1988 (Sections 10.1-2100, *et seq*., of the Code of Virginia (1950)). Section 10.1-2109.B of the Act states that "Counties, cities, and towns in Tidewater Virginia shall incorporate protection of the quality of State waters into each locality's comprehensive plan consistent with the provisions of this chapter." The City of Fairfax recognizes the importance of maintaining the integrity of State waters and the Chesapeake Bay to the citizens of the Commonwealth. The waters of the Chesapeake Bay have been degraded significantly by many sources of pollution, including nonpoint source pollution from land uses and development. Existing high quality waters are worthy of protection from degradation to guard against further pollution. Certain lands that are proximate to shorelines have intrinsic water quality value due to the ecological and biological processes that they perform. Other lands have severe development constraints as a result of flooding, erosion, and soil limitations. With proper management, they offer significant ecological benefits by providing water quality maintenance and pollution control, as well as flood and shoreline erosion control.

To achieve these ends, the City Council and the Planning Commission have, in accordance with the Chesapeake Bay Preservation Area Designation and Management Regulations (VR 173-02-01), developed a Chesapeake Bay preservation program which is centered around the City's Chesapeake Bay Preservation regulation of the Zoning Ordinance. This Chesapeake Bay Preservation component to the City's Comprehensive Plan builds upon the City's regulation and is designed to protect those qualities of life held important by the citizens of the Commonwealth and the City and to encourage future development that enhances and compliments the growth of the City as well as protects it natural resources.

2. Water Resources Protection Programs and Regulations

The City of Fairfax has made substantial progress towards ensuring the protection and balanced management of its natural resources through the implementation of various City regulations and water quality protection and pollution prevention programs. While the Chesapeake Bay Preservation regulation is the City's primary tool for protecting water resources within the City, water quality and natural resources protection requires an integrated approach.

This involves not only regulation but also citizen participation through the use of public education and volunteer programs. Enforcement of the City's Chesapeake Bay Preservation regulation must be coupled with a comprehensive examination of how the City's various land use regulations, including its Zoning and Subdivision ordinances, may be better utilized to protect the natural environment.

The following is an overview of the City's existing regulations and programs related to water quality and natural resources protection. These regulations and programs are then reexamined and options are presented for their improvement in light of an analysis of the City's water resources (Section 3.), existing and potential sources of pollution (Section 4.), and constraints to development (Section 5.).

APA-2.1. Chesapeake Bay Preservation Regulation

The Chesapeake Bay Preservation Act (Chapter 25, Title 10.1-2107 of the Code of Virginia) establishes a program to protect environmentally sensitive features which, when disturbed or developed incorrectly, lead to reductions in water quality in the Chesapeake Bay. The Act provides a framework for local government to identify these sensitive areas and to enact regulations to better plan land use activities on and around them. Under the regulations, the City of Fairfax is called to promote the following:

- Protection of existing high quality State waters and restoration of all other State waters to a condition or quality that will permit all reasonable public uses, and will support the propagation and growth of all aquatic life which might reasonably be expected to inhabit them;
- Safeguarding the clean waters of the Commonwealth from pollution;
- Prevention of any increase in pollution;
- Reduction of existing pollution; and,
- Promotion of water resource conservation in order to provide for the health, safety, and welfare of the present and future citizens of the Commonwealth.

In accordance with State guidelines, Chesapeake Bay Preservation Areas (CBPAs) were mapped for the City of Fairfax and the City adopted a Chesapeake Bay Preservation overlay district as part of the City's Zoning Ordinance (§26-18. et seq.) on October 9, 1990. The mapping of these areas, which include Resource Protection Areas (RPAs) and Resource Management Areas (RMAs), was based on a survey of existing natural resources documentation as well as field surveys.

Resource Protection Areas (RPAs) are lands at or near the shoreline/streambank containing components which are especially sensitive because of (1) the intrinsic value of the ecological and biological processes they perform which benefit water quality, or (2) the potential for impacts that may cause significant degradation to the quality of State waters. The RPA designation within the City includes the following:

- Non-tidal wetlands connected by surface flow and contiguous to tributary streams; and,
- An area not less than one hundred feet in width located adjacent to and landward of non-tidal wetlands and along both sides of any tributary streams.

In general, development within the RPA is limited to water dependent uses, passive recreational uses, utilities and public facilities, and certain types of redevelopment so long as the proposed land use is carried out in accordance with the provisions of the Fairfax City Code.

Resource Management Areas (RMAs) include land types that, if improperly developed, have the potential for causing significant water quality degradation or for diminishing the functional value of the RPA. The RMA within the City is composed of concentrations of the following land categories:

- Floodplains;
- Highly erodible soils, including steep slopes;
- Highly permeable soils;
- Non-tidal wetlands not included in the resource protection area; and,
- Steep slopes (slopes in excess of 15%).

In general, permitted development within the RMA includes those for the RPA as well as active recreational uses, certain types of redevelopment, and single-family home construction so long as the proposed land use is carried out in accordance with the underlying zoning district and the provisions of the Fairfax City Code. The purpose of the RMA is not to prohibit development within these areas, but rather to provide for well planned development which is sensitive to the special functions that the RMA provides.

In addition to specific criteria for RPAs and RMAs, general performance criteria for all lands included within CBPAs are meant to ensure maximum retention of indigenous vegetation, minimum practicable impervious land cover, adequate maintenance of any required water quality best management practices (BMPs), minimum land disturbance during construction, adequate site plan review, compliance with other regulations, vegetative buffer requirements, etc.

The general performance criteria also requires that the post-development nonpoint source pollution runoff loadings from new development does not exceed the predevelopment loadings based upon average land cover conditions within the City. Redevelopment of any site not currently served by water quality best management practices are to achieve at least a tenpercent reduction of nonpoint source pollution in runoff compared to existing loads from the site. Post development runoff from any site to be redeveloped that is currently served by water quality BMPs is not to exceed the existing load of nonpoint source pollution in surface runoff.

Implementation of the criteria is achieved through the use of performance standards, best management practices (BMPs), and various planning and zoning concepts. Map 2 presents the City's Chesapeake Bay Preservation Area Map. It should be noted that when conflicts between the Chesapeake Bay Preservation Area Map and the designation criteria arise, the designation criteria shall prevail.

APA-2.2. Erosion and Sediment Control Regulation

The purpose of the City's Erosion and Sediment Control Regulation is to prevent the degradation of properties, stream channels, waters, and other natural resources by providing that adequate soil erosion and sediment control measures are taken before, during, and after the period of site clearance, development, and construction. The Erosion and Sediment Control Ordinance implements the Virginia Erosion and Sediment Control Law (§§ 10.1-560 et seq., Code of Virginia (1950)) as well as the Chesapeake Bay Preservation Act.

Under this ordinance, land owners proposing a nonexempt regulated land disturbing activity of greater than 2,500 square feet must first submit an erosion and sediment control plan to the City Department of Public Works. The City's erosion and sediment control requirements are detailed in Chapter 9 of the City Code.

Map APA-2

Chesapeake Bay Preservation Area Map

APA-2.3. Tree Preservation, Landscaping & Screening Regulation

The purpose of the City's Tree Preservation, Landscaping, & Screening Regulation is to strengthen the City's ability to protect and enhance one of its most valuable natural resources. The regulation controls the removal of trees from public and private property and establishes standards limiting tree removal and ensuring the replacement of trees sufficient to safeguard the ecological and aesthetic integrity of the community's environment. In addition, the regulation was enacted: to prevent the unnecessary clearing and disturbing of land so as to preserve, insofar as is practicable, the natural and existing growth of vegetation; to replace, when feasible, the removed trees with the same, comparable, or improved species; to provide protective regulations against hazardous trees and diseased trees or shrubs, and the growth of weeds and brush; to control activities related to trees and plantings upon the streets or public properties of the City; and to establish a permit procedure for tree contractors.

Tree cover has long been recognized as serving to protect water quality. Tree canopy provides a buffer between precipitation and the soil by slowing the rate and velocity of rainfall.

Tree roots serve to keep soil particles in place and from washing away due to rainfall. Vegetation of all types also extract nutrients from water for use in plant tissues. In addition, tree cover in riparian areas serves to protect aquatic habitat by lowering and stabilizing stream temperature.

APA-2.4. Floodplain Regulation

In 1981, the Federal Emergency Management Agency investigated the existence and severity of flood hazards in the City of Fairfax to aid in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. The study was also meant to be used by local and regional planners in their efforts to promote sound floodplain management. To these ends, the City established a Flood Plain District as part of the City's Zoning Ordinance in 1982 (§ 38-38.). The purpose of the City's regulation is to prevent the loss of life and property, the creation of health and safety hazards, the disruption of commerce and governmental services and the extraordinary and unnecessary expenditure of public funds for flood protection and relief, and the impairment of the tax base by:

- Regulating uses, activities, and development which, alone or in combination with their existing or future uses, activities, and development, will cause unacceptable increases in flood heights, velocities, and frequencies.
- Restricting or prohibiting certain uses, activities, and development from locating within districts subject to flooding.
- Requiring all those uses, activities, and developments that do occur in flood-prone districts to be protected and/or floodproofed against flooding and flood damage.
- Protecting individuals from buying land and structures which are unsuited for intended purposes because of flood hazards.

In addition to protecting life and property, the floodplain regulation serves to protect water quality by decreasing the potential for stream bank erosion and by providing, in many instances, vegetated stream buffer areas which filter runoff from surrounding impervious areas. Map 3 depicts areas of Fairfax that have been designated as flood prone (the one-hundred year floodplain) for which the City's regulation applies.

APA-2.5. Zoning and Subdivision Ordinances

The City's Zoning and Subdivision ordinances provide the City with valuable tools for natural resources protection through better development and redevelopment practices. Many of the City's water quality protection regulations, including the City's Chesapeake Bay Preservation regulation and Floodplain regulation are contained within the City's Zoning Ordinance as overlay districts. Protection of water resources may be accomplished through the application of Zoning Ordinance provisions which relate to impervious coverage requirements, land use densities, etc. For instance, creative parking requirements to minimize impervious areas, including cooperative parking arrangements between businesses, may be used to minimize impervious cover. An examination of how the City's Zoning Ordinance and Subdivision Ordinance relate to the City's Chesapeake Bay Preservation regulation and water quality protection should be the next step in the City's ongoing Chesapeake Bay preservation activities. This assessment, along with provisions to demonstrate implementation and enforcement of the Chesapeake Bay Preservation regulation, will be required under Phase III of Chesapeake Bay Preservation Area Designation and Management Regulations implementation.

APA-2.6. City Source Control Programs

The control of pollutants before they enter stormwater or groundwater is recognized as the most cost effective and environmentally sound method of environmental protection. While the effectiveness of source control programs are difficult to ascertain due to their heavy reliance on human behavior modification, they are nevertheless integral components of the Commonwealth's Chesapeake Bay preservation effort. The City has addressed source control on a number of fronts, many of which are specifically geared at water quality protection and some of which have water quality protection as direct benefit.

Among the City's source control programs which benefit water quality are its street sweeping program, curbside leaf and brush pickup service, and recycling program.

Street sweeping, while generally recognized as having little practical effect in removing small particles and solubles (such as nutrients which are the primary pollutants of concern in the Chesapeake Bay), is effective in removing other harmful pollutants, particularly litter and sand from deicing and snow removal activities. Under the City's street sweeping program, main streets are swept once a week from March through early December and subdivision streets are swept three times a year. In order for the City's program to have a more substantial effect on water quality, more frequent and concentrated street sweeping would need to be implemented. Specifically, more intense street sweeping efforts in downtown areas, where nutrients and other pollutants tend to accumulate at higher rates, may be of direct benefit to water quality.

In addition to street sweeping, the City conducts a curbside leaf and brush pickup service which discourages those whose properties lie within a RPA from dumping yard waste near streams where it can kill vegetation. This practice can result in erosion and the leaching of excess nutrients into the local stream. In conducting its program, the City should take care to make sure that leaves are not placed directly in the gutter where they can be washed into the local stream course.

The City has an extensive recycling program which has collections for most recycling materials including plastics, glass, metals, etc. The City also collects potentially hazardous substances such as used oil, oil filters, pesticides, and other hazardous waste at its Automotive Maintenance Shop. The City then transports these materials to Fairfax County's West Ox Road Transfer Station. The City advertises its recycling program in the Public Works Department's insert to the City's monthly newsletter several times a year. New homeowners are provided with a packet of information on recycling requirements and facilities within the City.

In addition to City source control efforts, the Department of Environmental Quality, Water Division, works directly with owners of underground storage tanks (USTs) to ensure that these tanks do not impact on groundwater quality. The DEQ, Water Division, has an extensive monitoring program to detect and mitigate any leaking USTs before substantial groundwater quality degradation can occur.

APA-2.7. Local and Regional Watershed Management Efforts

For many years, the stormwater drainage system of the City of Fairfax has been under considerable stress as the result of a rapid increase in the City's jurisdiction-wide imperviousness. Several types of stormwater system problems have been identified within the Accotink Creek watershed including

Map APA-3
Floodplain Map

streambank and streambed erosion, sedimentation, localized flooding, deteriorated drainage facilities, limited capacity of the drainage system as originally designed, and finally, pollutants affecting water quality.

In the last decade, two water quality related regulations have been enacted that has made it necessary for the City to investigate and address these problems on a watershed-wide basis. In 1987, the federal Clean Water Act was amended to require National Pollution Discharge Elimination System (NPDES) permits for discharges from municipal separate storm sewer systems. Currently, only municipal systems serving populations of 100,000 or more are required to obtain permits. The permit application process is an extensive procedure which, in part, requires the development of stormwater management plans. It is anticipated that a permitting requirement will be promulgated for smaller municipalities in the not-too-distant future. In addition, the 1988 Chesapeake Bay Preservation Act, as discussed previously, requires localities to adopt programs to protect water quality in the Chesapeake Bay from excessive nutrients caused by stormwater runoff from impervious surfaces.

In 1993, the City contracted for a Stormwater Systems Capital Needs Study to address its stormwater management needs. Through the extensive use of field surveys, the study identifies problems associated with the City's storm drainage system and makes recommendations for the management of these problems in the form of projects to be included in the City's Capital Improvements Program. The study makes recommendations for 14 projects including detention ponds, underground detention systems, permanent sediment traps, check dams and flow control weirs, channelization, rip rap, and bioengineered armoring. Map 4 represents the general location of recommended projects. The 1993 Study provides a more detailed description of the projects.

The development of the stormwater management plan was based on three interlocking strategies: increasing storage so as to reduce extensive flow rates; controlling erosion by means of increasing resistance of stream channels to the erosive effects of storm flows; and, constructing downstream basins to trap any stream transported sediment and thus avoiding sediment clogging of critical drainage structures.

Highest precedence was given to areas where flooding has the immediate potential to inflict property damage. Moderate precedence was given for areas with flow capacity restrictions caused by erosion, sedimentation, and deterioration of infrastructure. Other concerns included items such as nuisance flooding, water quality deterioration, and the need for increased future capacity. While directly correcting for water quality problems was not the primary consideration of the report, control for erosion and flooding will greatly reduce pollutant loadings to local water courses.

In addition to the 14 structural projects cited in the report, additional recommendations were made concerning computerized streamflow management, water quality inlets, pilot projects, and on-site detention design criteria.

Map APA-4

Storm Water Management Improvement Recommendations for the Accotink Watershed

The City's Stormwater Capital Financing Task Force is currently in the process of finding an appropriate approach to funding the recommendations cited in the report. In addition to the recommendations made in the report, the Task Force has established that public education should be a major component of the project and that the City should keep the citizenry informed about the nature and seriousness of these problems, the project's planned completion dates, how much the projects will cost, what they will look like when they are completed, and what problems they are designed to correct and how they are expected to correct them. The Task Force also notes that opportunities for public interaction and comment should be provided at every stage in the process. Public education will raise awareness of the need for pollution prevention in order to help reduce future costs of protecting water quality in the City.

The City's location at the headwaters of four major watersheds does not lend itself well to reciprocal regional watershed planning efforts. However, due to the City's unique geographic location, it has a special responsibility to those downstream to protect water quality. The only regional watershed agreement within the area is the Occoquan Policy, which was implemented by the Virginia Water Control Board in 1982 to protect one of the region's primary drinking water supplies at the Occoquan Reservoir. Although the City is not a participant due to the very small portion of the total drainage area which lies within its boundaries (the Popes Head Creek Watershed), interjurisdictional cooperation and jurisdiction-wide public education (not just in the Accotink portion of the City where most problems are acute) will aid in the protection of this valuable water resources.

3. Inventory of Existing Water Resources

The City of Fairfax contains a wealth of natural resources which benefit both residents and businesses within the City. Of its natural resources, the City's water resources are among the most important from an economic, social, and ecological point of view, as well as the most sensitive. Land uses and development, air pollution, and human carelessness all contribute to the degradation of water resources. The City has been able to protect many stream corridors through the expansion of its public park system and the preservation of vegetative buffers. However, in the years after World War II, as the population grew from only 1,946 in 1950 to 19,622 in 1990, development pressures resulted in a dramatic increase in the City's impervious acreage and a loss of natural vegetation. While past responses to the pressures of development have resulted in the implementation of erosion and sediment control measures, stormwater quantity measures to control flooding, and floodplain protection, only recently have the post-development effects of urbanization on water quality been fully appreciated and addressed.

In 1988, the City recognized the growing importance of water quality protection and cooperatively established a systematic stream-monitoring program with the Fairfax County Public Health Department to gauge the long-term health of the City's streams. With the adoption of the City's Chesapeake Bay Preservation regulation in 1990, the City committed itself to a comprehensive and integrated approach to water quality protection. In order to better plan for future development and redevelopment within the City and to identify ways to enhance the quality of life through the preservation and restoration of the City's water resources, it is important to understand the resources which exist within the City. The following section presents an inventory of the water resources within the City including watersheds and streams, water supplies, water supply protection, and groundwater.

APA-3.1. Streams and Watersheds

The City of Fairfax is located at the confluence of four major drainage divides and includes portions of the Accotink Creek, Pohick Creek, Pope's Head Creek, and Difficult Run watersheds. As a unique consequence, practically all watercourses within the City (with the exception of a few tributaries to Accotink Creek in the northeastern portion of the City) originate within its boundaries and are not directly affected by activities from neighboring jurisdictions. This provides a considerable level of control to the City over the water quality of its streams. Major perennial streams which flow through the City of Fairfax include Accotink Creek (north and central forks) and Daniel's Run (also known as the south fork of Accotink Creek), which drains to Accotink Creek within the City. Many smaller tributaries drain to Accotink Creek and Daniel's Run in a roughly dendritic (branched) pattern which has been substantially modified by development and channelization.

The City of Fairfax contains the headwaters of Accotink Creek, which flows through southern Fairfax County and empties into Accotink Bay and Gunston Cove and then into the Potomac River. Within the City, Accotink Creek is primarily a gravelly bottomed fast flowing stream. However, in some wide, shallow, or slower moving areas, particularly in areas upstream of culverts, thick layers of sediments have been deposited over the gravel as a result of excessive erosion and both natural and man-made stream course blockage. Throughout much of the City, Accotink Creek is only five to ten feet wide and relatively shallow. However, the creek widens to ten to twenty-five feet and is several feet deep where it exits the northeastern edge of the City near the intersection of Pickett Road and Old Pickett Road in Thaiss Park.

According to the Division of Soil and Water Conservation's Hydrologic Units Map of Northern Virginia, the City of Fairfax lies primarily within the Accotink Creek/Pohick Creek watershed (Unit #A19) which drains approximately 93% of the City. Most of this area drains to Accotink Creek while only a relatively small area drains to Pohick Creek. The Difficult

Run watershed (Unit #A23), which drains the area west of Jermantown Road, covers approximately 3% of the City while the Popes Head Creek watershed (Unit #A12), which drains the southwestern portion of the City, covers approximately 4% of the City. Popes Head Creek flows through south-central Fairfax County, bisecting the Town of Clifton, and eventually empties into the Occoquan Reservoir. This is significant due to the fact that the Occoquan serves as a primary drinking water supply for over 880,000 Northern Virginians, although the City itself does not receive its primary water supply from the Reservoir. Map 5 presents a schematic of the major streams within the City as well as its major watersheds. The map also shows the location of stream monitoring stations which are discussed in Section 3.3.

Tributary streams within the City are subject to runoff from shopping centers, garages, parking lots, and other potentially high pollution areas. Storm drains feed the majority of the streams passing through the City and have been implicated, since sampling of the streams began in 1988, as sources of pollution from improperly disposed petroleum products. Although many tributaries have been cleared to their banks, or have been modified to enhance drainage capacity, only a relatively small proportion of the City's perennial streams have actually been piped or channelized with concrete. The implications that the City's land uses, impervious cover, and human activities have on water quality are further detailed in Section 4.

APA-3.2. Water Supply and Water Supply Protection

The principal source of potable water for the City is the Goose Creek Reservoir in Loudoun County. The City owns and maintains two water reservoirs in Loudoun County, seven miles northwest of Sterling Park and approximately 18 miles from the City limits. Water from the reservoir is pumped to a City-owned water treatment plant one-half mile east of the reservoir. The treatment plant has a rated capacity of 12 MGD volume and a peak capacity of 18 MGD. The City's water system serves not only the City, but also portions of Fairfax County immediately north, south, and east of the City. The City also wholesales water to both the Loudoun County Sanitation Authority and the Fairfax County Water Authority. Water demand for the City is not expected to increase significantly since service area boundaries are fixed and the area is almost completely developed. The current water system will, therefore, meet the City's needs in the foreseeable future.

Development pressure in eastern Loudoun County, as a result of the proposed extension of the Dulles Toll Road from the rapidly expanding Dulles International Airport area to the Town of Leesburg, has resulted in a heightened interest in how to best protect the City's water supply. The completion of the 14.5 mile long toll road is expected to result in substantial urbanization of the eastern section of now largely rural (or vacant) Loudoun County. In response to this anticipated development, the Loudoun County Board of Supervisors and Planning Commission identified a need to formulate more

Map APA-5
Major Streams and Watersheds

specific land use policies in order to balance industrial, commercial, and residential land uses with the environment, transportation, and public utilities infrastructure. In 1993, the County charged the Toll Road Plan Technical Committee (TRPTC), formed of representatives from the County, citizens groups, the Town of Leesburg, and a number of local, regional, and State authorities, to arrive at a Toll Road Plan. The City of Fairfax had no formal seat on the Committee; however, the City was invited to review and comment on the draft document. In January of 1994, after a public comment period, the TRPTC forwarded the draft Plan to the Planning Commission.

Recognizing the need to protect the City's water supply, as well as Loudoun County's own natural and water resources, the Committee recommended several special protection measures for the Goose Creek watershed. Policy options included in the draft Dulles Toll Road Plan include 1) prohibiting warehouse, manufacturing, industrial, or other uses which generate, utilize, store, treat, or dispose of solid, hazardous, or toxic wastes or material in the Goose Creek or Beaverdam Creek Reservoir watersheds until the County adopts a watershed protection program, 2) requiring the use of stormwater best management practices (BMPs) in accordance with the Northern Virginia BMP Handbook for all development in the Goose Creek and Beaverdam Creek Reservoir watersheds, 3) promoting the development and distribution of educational materials on the protection of water quality for landowners in the watersheds, 4) seeking to preserve 100 year floodplains in their natural, vegetated condition, 5) requiring a 300 foot vegetative buffer around Beaverdam Creek and Goose Creek Reservoirs in accordance with the Loudoun County General Plan and 150-200 foot buffers along reservoir tributaries in accordance with the scenic creek valley buffer requirements in the Zoning Ordinance, 6) adopting a watershed protection plan which identifies what use density levels can be accommodated in the Goose Creek and Beaverdam Creek Reservoir watersheds without significantly degrading water quality in the reservoirs, 7) depending upon State and federal regulations to protect wetlands including buffering and preservation, 8) preserving one hundred year floodplain except for uses permitted in the County Floodplain Ordinance, and 9) discourage development on slopes of greater than 15%.

The Loudoun County Planning Commission has reviewed the Plan and has referred comments to the Loudoun County Citizens Public Review Committee. It is anticipated that the City of Fairfax will continue to be consulted for review of the Plan in order that the City and the County may cooperatively protect a mutually valuable resource.

In addition to protecting the City's water supply from pollution, water conservation practices help conserve and protect it from depletion. Conservation also reduces the amount of potable water that reaches the City's sanitary sewer system and reduces the potential that landscape irrigation and car washing will result in water pollution. The City's water conservation programs are coordinated through the Code Administration Office of Fire and Rescue Services and the Water and Sewer Office of the Department of Transit and Utilities.

The Code Administration Office enforces Virginia Code provisions requiring the installation of low consumption water fixtures during new construction and fixture replacement. This includes low flush toilet fixtures (1.6 gallon as opposed to 3.5 gallon) which can save upwards of 48 gallons of water per day for an average family of four. The Department of Transit and Utilities provides new water customers with a 16 page "Water Conservation Guide" which contains information on why water conservation is important, effective landscape watering techniques, water-saving measures which can be undertaken in and around the home. The pamphlet is sent out approximately once a month when a list of new customers within the City is generated.

In addition to these measures, the City should develop a program to encourage City residents on a more regular basis to practice water conservation, including the voluntary replacement of water-intensive (or leaky) fixtures in the home with new low consumption fixtures. This may be accomplished through the periodic inclusion of an educational leaflet with City water bills. It is at this time the customer is most inclined to be thinking about ways to reduce his/her water bill. Incorporation of water conservation into the school curriculum is also an effective approach and has been used elsewhere in northern Virginia, including Arlington County.

APA-3.3. Quality of Surface Water Resources

Protecting the quality of surface water resources is a concern for many urban jurisdictions. The removal of tree canopy cover, which serves to stabilize and cool stream temperatures, as well as increased imperviousness of surrounding areas, which increases the volume and velocity of stormwater runoff into local streams, have a generally negative effect on stream water quality. Water quality may be decreased as a result of pesticide and fertilizer laden runoff from adjacent lawns or by runoff from parking lots which may contain nutrients, heavy metals, and hydrocarbons. Eroding stream banks contribute to urban water quality problems by choking local streams with sediment. Illegal dumping into storm sewers, trash and litter, animal and pet wastes, and leaking above ground and underground storage tanks also take their toll on urban water quality. The following provides an overview of the present quality of the City's surface water resources.

All streams in the City of Fairfax are classified as Class III streams, those which are non-tidal in nature in the Coastal and Piedmont zones, for water quality standards. Under the federal Clean Water Act (CWA), all waters are expected to be maintained to support recreational use and the propagation and growth of all aquatic life reasonably expected to inhabit

them. These are known as the CWA "swimmable" and "fishable" goals. The parameters used to measure these goals are minimum and daily average dissolved oxygen content (DO), pH, maximum temperature, and fecal coliform bacteria level. Fecal coliform levels are the most important from a human health standpoint. These indicator organisms, while not necessarily harmful in themselves, are found in the intestinal tracts of warm-blooded animals, including humans, and can be indicative of fecal contamination and the possible presence of pathogenic organisms. Temperature, DO, and pH are the primary indicators of the health of the aquatic ecosystem. The presence of DO in water is essential for aquatic life and the type of aquatic community is dependent to a large extent on the concentration of dissolved oxygen present. Strongly related to pH are biological productivity, stream diversity, metal solubility, and the toxicity of certain chemicals, as well as important chemical and biological activity. Temperature affects feeding, reproduction, and the metabolism of aquatic animals. A week or two of high temperatures each year may make a stream unsuitable for sensitive aquatic organisms. Table 1 contains the minimum water quality standards for Class III waters.

The Fairfax County Health Department, Division of Environmental Health, in cooperation with the Virginia Department of Health and the City of Fairfax, conducted water quality monitoring for several City streams for the period of 1989 to 1993. During the 1993 sampling period, a total of 21 to 23 samples were taken for each of the eight sampling stations. Sampling stations are located on Accotink Creek, Daniels Run, and their tributaries. The location of these sampling stations are found on Map 5.

Results of the 1993 sampling period showed that 48% of samples tested for fecal coliforms had levels greater than or equal to 1,000 fecal coliforms/100 ml, which is the maximum acceptable instantaneous fecal count under the CWA. Only 18% of the samples tested had levels less than 200 fecal coliforms/100 ml, the maximum sustained level considered safe under the CWA. These are the same results as in the 1992 testing period; however, the geometric log average for fecal coliforms for all City of Fairfax streams continued to increase. The log average for City of Fairfax streams rose from 886 fecal coliforms/ml in 1992 to 997 fecal coliforms/ml in 1993. City streams are substantially above the maximum acceptable geometric log average for fecal coliforms as prescribed by the CWA and have been so since testing began. The trend for fecal coliforms for the City of Fairfax are the same as the remaining downstream samples in the watershed. While both are rising, the City of Fairfax stream sample sites have a higher log average. This is especially true during the summer months of June through August when the geometric log average is greater than 1,000 fecal coliforms. Since the headwaters of the Accotink Creek originate within the City of Fairfax, the high fecal coliform counts are a direct result of activities in the City.

There are several explanations for the high level of fecal coliform contamination in the City's streams. Among the two most likely sources are the improper disposal of animal/pet wastes and leaky sewer lines. Other potential sources which are not likely include improperly sealed or malfunctioning water wells and septic systems. The City, in its 1993 Stormwater Systems Capital Needs Study identifies several areas where sewer and other utility lines have been exposed in stream beds. While it is not necessarily the case that these are leaking, it is a possibility the City may wish to examine as a measure of pollution prevention. The Stormwater Systems Capital Needs Study presents options on how to remedy this situation. More likely, inadequate heed of local animal waste control regulations results in animal wastes being deposited on paths near streams or on City curbs and gutters which are subsequently flushed into local watercourses.

Table APA-1

Virginia Fishable and Swimmable Water Quality Standards for Class III Waters

The cooperative monitoring program also tested for pH, phosphorus, nitrogen, and dissolved oxygen. The pH of water in City streams ranged from a low of 6.5 to a high of 9.0. Only one sample in 1993 (and three in 1992) was recorded above the CWA recommended maximum level of 8.5. The average pH for City sites was 7.3 for 1993. Average total phosphorus levels ranged from a low of 0.10 mg/l to a high of 0.90 mg/l. Average nitrate nitrogen ranged from a low of 0.10 mg/l to a high of 0.25 mg/l. The overall average for all stream sites within Fairfax City was 0.63 mg/l. The dissolved oxygen results ranged between 2.8 mg/l for the low to 14.2 mg/l for the high, with 10 sample results less than 4 mg/l.

Unpolluted waters generally have a nitrate level below 1.0 mg/l and levels above 10.0 mg/l are considered unsafe for drinking water. Phosphorus levels higher than 0.03 mg/l contribute to increased plant growth (eutrophication) and levels higher than 0.1 mg/l may stimulate plant growth sufficiently to surpass natural eutrophication rates. As such, nitrate nitrogen levels appear to be well within these limits while phosphorus loadings would be considered high. While nitrate and phosphorus levels are not of significant concern for faster flowing streams such as Accotink Creek and Daniels Run, excessive levels of these nutrients help contribute to eutrophic conditions and poor water quality in the Potomac River and the Chesapeake Bay. For these reasons, the City has enacted its Chesapeake Bay Preservation regulation to control nutrient loadings flowing from City streams into the Potomac River and Chesapeake Bay.

Although the Fairfax County Health Department does not test for suspended sediments or total suspended solids, erosion and subsequent sedimentation is identified as a water quality problem in City streams in the City of Fairfax Stormwater System Capital Needs Study. Several streambanks within the City are identified as experiencing significant erosion. While the effects of this erosion on water quality has not been quantified, the effects on local properties and flooding as well as reduced capacity of streams to handle stormwater flows is apparent. Erosion and sedimentation problems are further discussed under Section 4.

While the City of Fairfax Stormwater System Capital Need Study did not include an analysis of water samples, and no attempt was made to quantify specific water quality problems, several observations regarding water quality were made. Along Accotink Creek and its tributaries, excessive amounts of litter and debris were reported as having accumulated either from direct dumping, transport by stormwater runoff from roads and parking lots, or deposition from flooding. The report notes several areas where water was discolored or where an oily sheen was present. (Refer to Map 6 for the general location of identified problem areas.) No source for these water quality problems was immediately identified, although oil/petroleum contamination can occur as a result of leaking underground or above ground storage tanks, automotive activities on adjacent parking lots, and dumping.

Figure APA-1

Geometric Mean for Fecal Coliforms in City Streams and Instantaneous Fecal Coliform Counts for 1993

Map APA-6
Identified Storm Water System Problem Areas in the Accotink Watershed

APA-3.4. Groundwater Resources

While the City of Fairfax no longer relies on groundwater resources for its potable water supply, groundwater is nonetheless an important water resource. An investigation of the groundwater resources of the City is important because groundwater is intimately connected with the ecosystem as it provides the baseflow to many rivers, streams, ponds, lakes, and wetlands. Groundwater is also an issue of regional importance due to its dynamic nature, as was shown when a leaking oil storage tank at the Fairfax Tank Farm formed a plume which spread from the eastern edge of the City into the Mantua neighborhood of Fairfax County. Because the City no longer relies on groundwater for its potable water supply, recent data on City-wide groundwater dynamics and quality is not available. However, because groundwater quality, excepting for outright pollution, is largely dependent on underlying geology, many older sources of information are still relatively accurate for descriptive purposes.

The City of Fairfax is located entirely within the Piedmont geological province. The groundwater aquifer of the Piedmont consists almost exclusively of crystalline (metamorphic and igneous) rock and their residual materials. Other aquifers within the City, which include the alluvium of local stream valleys, tend to be poor producers of groundwater. Crystalline rock by itself, because of its compact nature, yields little or no water to wells. Groundwater movement in the Piedmont is controlled largely by fractures, joints, and faults within rock bodies. Most of the rock in the City has been considerably fractured and therefore contains water-bearing structures. Some drilled wells in the Piedmont fit the definition of an artesian well; that is, groundwater in the well is at sufficient pressure to rise above the ground surface. This artesian process is responsible for the many free-flowing springs which feed streams in the Washington metropolitan area.

The chemical composition of groundwater and water bearing properties of local aquifers is largely dictated by underlying geology. On average, most of the City's underlying geology is considered to have only fair water bearing capacity of 10 to 25 gallons per minute (GPM). Areas with the best potential for producing groundwater supplies are located in the eastern and central portions of the City (the Wissahickon Formation) which on average produces 14 GPM. Mafic rocks, which underlie the far western portion of the City produce an average groundwater supply of 13 GPM. In general, the chemical composition and purity of groundwater within the City is within the limits of U.S. EPA aesthetic standards relating to taste, odor, and color (Secondary Maximum Contaminant Levels, or SMCLs). It should be noted that groundwater characteristics within the City will vary depending on the location and depth of the well.

The specific groundwater characteristics of the City of Fairfax are defined by its two major underlying geologic formations; mafic rock and the Wissahickon Formation (primarily quartz-mica, schist, phyllite, and quartzite). Data presented here is applicable to all areas in metropolitan Washington with these geologic conditions. Data for mafic rock may not be well represented due to the small sample size. Groundwater produced from all rock types tends to be soft (<60 mg/l $CaCO_3$) with some areas exhibiting moderately hard characteristics. Hard water tends to cause excessive consumption of soap and deposition of scales in pipes, water heaters, and boilers.

Groundwater in the City tends to contain low levels of total dissolved solids with averages ranging from 68 ppm to 96 ppm with a maximum reported at 157 ppm. The EPA's recommended maximum for total dissolved solids is 500 ppm.

Groundwater for all rock types tends to be fairly acid, with average pH levels ranging from 6.2 to 6.8. In some instances, wells have exhibited less than the EPA recommended minimum pH of 6.5. While this is a natural phenomenon, high acidity may result in corrosion of copper water lines, resulting in copper and lead in drinking water drawn from groundwater. The corrosive nature of highly acid soils also requires that special consideration be given when designing and placing underground storage tanks. While most newer underground storage tanks are designed to counterbalance corrosive soils, many older tanks may be at risk and should be given appropriate attention and monitoring.

Iron, which may be objectionable at levels above 0.3 mg/l, is found in most of the groundwater drawn from Piedmont rock. Average iron concentrations for groundwater associated with the City's geologic conditions are found at levels at or above the EPA's minimum threshold, and all rock formations reported have maximums far above the EPA limit. Excessive iron will cause stains in laundry, cooking utensils, and porcelain fixtures and also may impart an objectionable taste and color to food and beverages. Other constituents tested for in well water for which no problems were reported include sulfates, chloride, fluoride, nitrate, phosphate and color.

4. Existing and Potential Sources of Water Pollution

While some level of environmental pollution resulting from human activity may be inevitable, the cost of pollution and its effects on quality of life should not be ignored. Unmanaged pollution can result in surface and groundwater contamination, poor air quality, aesthetic degradation of the landscape, and the destruction of important ecological habitats, all of which detract from the City's basic character. The most cost-effective approach to the problem of pollution is to prevent it at its source. A number of tools are available to the City to aid in pollution prevention, including public education and awareness programs, water conservation, lawn care programs, and recycling efforts, to name only a few. The cost to the City once environmental damage is done includes not only short term clean-up costs, but long-term costs including decreased property values and loss of tax base. The following section describes the City's existing sources of pollution as well as potential sources of pollution which the City may face as it grows and develops.

4.1. Point Source Pollution

Point source pollution is pollution which can be attributed to a specific outfall and is therefore often the most easily recognizable and regulatable form of pollution. Industries and municipalities, under the federal Clean Water Act, National Pollution Discharge Elimination System (NPDES), are required to report pollution discharges to water courses above a certain threshold, and to the maximum extent practicable, mitigate the effects of the pollution on the environment. The Virginia Department of Environmental Quality, Water Division, maintains records on these sources of pollution and is charged with ensuring that environmental regulations are enforced.

There are two NPDES discharge points located within the City of Fairfax (VA0001872 and VA0002283), both of which drain to tributaries of Accotink Creek (see Map 7). The discharge points are associated with ongoing activities at the Fairfax Tank Farm Terminal Complex located on Colonial Avenue. The City's water quality is not affected by any upstream point source discharges from surrounding Fairfax County or other jurisdictions. There are currently no municipal discharge points in the City which fall under NPDES regulations. However, future extensions of NPDES regulations will make it necessary for the City to address the issue of stormwater discharges (via storm sewers and culverts) into local waters. The City has already taken the first steps towards identifying sources of stormwater pollution and has published the City of Fairfax Stormwater System Capital Needs Study which outlines findings and proposed solutions. Unless piped, stormwater runoff is considered nonpoint source pollution and is further discussed under Section 4.2.

4.2. Nonpoint Source Pollution

Nonpoint source pollution is pollution which cannot be attributed to a single source but is the result of many diffuse sources. Considered singularly, each small source would not constitute a problem, but together these nonpoint sources constitute a substantial threat to water quality. Most commonly, nonpoint source pollution is caused by rainfall running off roadways, parking lots, roof tops, and other urban land uses. Urbanization increases the imperviousness of a land area, thereby increasing the amount and velocity of stormwater runoff delivered to nearby streams. Pollutants which would normally settle out or infiltrate through the soil are carried directly to local waterways. On a per acre basis, urban land use in general, including residential development, produces higher annual nonpoint source pollutant loadings of nutrients, heavy metals, and oxygen-depleting substances than do rural agricultural uses. In addition to transporting pollution, increased runoff also increases instream flow during and immediately after periods of precipitation. This results in increased soil erosion and the destruction of wildlife habitat. Oil contamination, sediments, pesticides, metals, and other toxic substances can kill fish and destroy bottom life.

The effect on local waterways is a general degradation of water quality and a phenomenon known as eutrophication. Eutrophic conditions, caused by excessive nutrients in the

Map APA-7
Location of NPDES Discharge Points in the City of Fairfax and Vicinity

water, are characterized by low dissolved oxygen levels and high algal growth. The primary detrimental effect on water resources, particularly on large bodies of water such as the Potomac River and the Chesapeake Bay, is algal blooms, which block sunlight from aquatic life and deplete the dissolved oxygen content during decay. Eutrophication also destroys the recreational use of water resources and results in strong odor and undesirable taste.

Because the City of Fairfax lies within the Tidewater area of Virginia, which has a significant impact on the health of the Chesapeake Bay, controlling nonpoint source pollution is an important aspect of the City's environmental protection efforts. The Virginia Division of Soil and Water Conservation has designated the control of nonpoint source pollution as a high priority for all watersheds within the City.

Nonpoint source pollution from urban areas can be controlled by minimizing impervious areas from new development, reducing impervious areas through redevelopment, utilizing open space and preserving indigenous vegetation, restoring denuded vegetative stream buffers, and by employing the use of structural or nonstructural best management practices

Map APA-8
Existing Land Use Imperviousness by Watershed

(BMPs), which operate by trapping stormwater runoff and detaining it until unwanted nutrients, sediment, and other harmful pollutants are allowed to settle out or be filtered through the underlying soil. The City's Chesapeake Bay Preservation regulation requires the achievement of certain performance standards for any development which takes place in a designated Chesapeake Bay Preservation Areas.

A useful analysis tool in nonpoint source pollution mitigation is to examine where highly impervious areas of the City are in relation to the City's water resources. In this way, various nonpoint source pollution control efforts, from educational programs to redevelopment, can be concentrated on those areas most likely to produce the greatest impact on the quality of City water. Since the City of Fairfax is largely built out, these figures are helpful when considering where to concentrate redevelopment or retrofit to improve water quality. It is also useful in deciding where and what types of public education programs may be beneficial. Map 8 presents a picture of the City according to the average imperviousness of predominant land uses as identified in the City's Existing Land Use Map.

Table 2 presents a breakdown of City land uses and associated imperviousness rates by watershed. This information is useful so that watersheds with the highest degree of impervious area (which would correspond roughly to areas with the highest incidence of nonpoint source pollution) may be targeted for nonpoint source pollution controls. The City-wide imperviousness rate is also used by the City in determining performance criteria and nutrient removal requirements for best management practices under the City's Chesapeake Bay Preservation regulation.

The average impervious cover of the City is 45%. The predominant land use within the City is single family detached, which comprises approximately 47% of the City's land area. Commercial uses comprise the second largest land use at 11%, while parks and open space comprise just over 10% of the City's land area.

The most impervious watershed of the City is Difficult Run, which is approximately 63% impervious. This is primarily due to the high proportion of institutional, commercial, and multi-family areas within the watershed. As a consequence, stormwater quality management retrofit in the Difficult Run watershed will have a greater net pollution reduction effect than in other watersheds. Since the Difficult Run watershed contains a high concentration of multi-family dwelling units, public education programs may be targeted more efficiently. It should be noted, however, that the type of a public education campaign for a multi-family area will be very different from a campaign targeted for other types of housing, particularly single-family housing. For instance, single-family homes typically have yards, and therefore public education may

Table APA-2

City Land Uses and Imperviousness by Watershed

Existing Land Use	City Total		Pohick Creek		Popes Head		Difficult Run		Accotink Creek		Land Use Imperviousness	
	acres	%	acres	%	acres	%	acres	%	acres	%	acres	%
SF Detached	1858.1	47.4%	95.7	86.2%	95.4	56.6%	12.2	12.6%	1654.7	46.6%	557.4	30.0%
SF Attached	168.8	4.3%			12.4	7.4%	12	12.5%	144.3	4.1%	126.6	75.0%
Multi-Family	121.6	3.1%			9.2	5.4%	19.2	19.9%	93.3	2.6%	91.2	75.0%
Transitional Office	31.3	0.8%							31.3	0.9%	28.2	90.0%
Office	178.8	4.6%					3.9	4.1%	174.9	4.9%	160.9	90.0%
Commercial	424.1	10.8%			10.2	6.0%	19.2	20.0%	394.7	11.1%	381.7	90.0%
Industrial	170.4	4.3%							170.4	4.8%	153.3	90.0%
Park & Open Space	404	10.3%			15.8	9.4%			388.2	10.9%	60.6	15.0%
Mixed Use	2.5	0.1%							2.5	0.1%	2.2	90.0%
Institutional	316.8	8.1%	15.4	13.8%	16.6	9.8%	24.8	25.7%	260	7.3%	158.4	50.0%
Vacant	247.2	6.3%			9.1	5.4%	5	5.2%	233	6.6%	37.1	15.0%
Total	3923.6	100.0%	111.1	100.0%	168.7	100.0%	96.3	100.0%	3547.4	100.0%	1757.7	44.8%
% of City within Watershed		100.0%		2.8%		4.3%		2.5%		90.4%		
% Watershed Imperviousness		44.8%		32.8%		39.1%		63.4%		44.9%		

concentrate on turf management programs. A public education program in a multi-family situation may concentrate on water conservation, driving and automobile repair habits, or recycling. Accotink Creek watershed is the second most imperviouswatershed with an average imperviousness near the average of 45%. Pope's Head Creek and Pohick Creek watersheds have relatively little impervious area at 39% and 33% respectively. Pohick Creek watershed consists almost predominantly of detached single family homes (86%) with some institutional uses. Popes Head Creek watershed consists primarily of single family detached (57%) with a mix of other uses. Neither Pohick Creek watersheds or Difficult Run watersheds contain any park or public open space areas.

The City's nonpoint source pollution control program also includes the City's Erosion and Sediment Control Ordinance. This ordinance requires that stormwater management facilities be installed during construction to help control increased stormwater runoff created by development thereby reducing the possibility of downstream flooding and erosion.

4.3. Streambank Erosion and Sedimentation

While streambank and land erosion is a natural process, land development has greatly accelerated this process. As large areas of once forested land have been paved over, a greater quantity of stormwater is directly piped into local waterways with little or no opportunity for infiltration into the soil, and at a much higher velocity. Signs of stormwater erosion include undercut streams and fallen banks, felled bushes and trees which once lined the banks, and exposed sewer and other utility pipes. Suspended sediments choke and muddy local waterways making them uninhabitable to local species of aquatic life. In addition, nutrients and other pollutants attach themselves to sediment particles and contribute to eutrophic conditions in the Potomac River and the Chesapeake Bay. Eventually, suspended sediments are deposited in slower moving portions of the stream course, causing buildup, destruction of benthic life forms, and a decreased stream capacity for floodwaters, thus resulting in greater potential for further erosion and property damage.

As part of its effort to comprehensively address stormwater system needs for the City, the City contracted with Engineering-Science Inc. to produce a Stormwater System Capital Needs Study in 1993. A significant part of the effort was directed at identifying those stream reaches experiencing streambank erosion and to identify solutions to those problems. The City has already increased the amount of stormwater detention required for new development to control for a 100 year flood so as to ensure that new development does not contribute to flash flooding and increased volume. The City has identified several areas along Accotink Creek and Daniels Run which are experiencing various erosion problems. The most severe of these problems occur along bends in the stream course, although severe erosion is occurring in many areas. In addition to a number of projects which are designed to increase stormwater detention times, the plan also includes several stream bank restoration and protection measures. Map 4 shows those stream reaches identified in the Stormwater System Capital Needs Study which are recommended for stabilization as part of the restoration process. The report makes recommendations for the stabilization of these streambanks as part of the City's larger stormwater needs which is in response to the City's proposed NPDES program.

4.4. Malfunctioning Water Quality BMPs

In response to the water quality requirements of the Chesapeake Bay Preservation Act, many development sites within the City will be called upon to establish water quality best management practices (BMPs). These BMPs are designed to detain polluted stormwater runoff until harmful pollutants have had a chance to settle, at which time the stormwater is slowly released. However, BMPs, like most other structural facilities, will deteriorate over time and require regular maintenance. Adequate maintenance will prolong the expected life-span of a facility, therefore saving considerable money in the long-run. Further, while a properly functioning facility enhances downstream environments by mitigating the environmental impacts of land development, pollutant removal efficiencies will decline over time if regular maintenance is not performed.

To ensure that a BMP facility continues to perform its intended function, the BMP operator must establish and sustain a comprehensive, regularly scheduled maintenance program. In the City of Fairfax, it is the responsibility of the private developer to establish a viable, long-term BMP maintenance program.

While there is currently only one BMP facility established in the City as a result of the City's Chesapeake Bay Preservation regulation, the City must plan in advance to ensure that adequate resources are available for inspection and maintenance of future BMP facilities.

4.5. Underground Storage Tanks

The Virginia Department of Environmental Quality, Water Division, is responsible for permitting and tracking underground storage tanks (USTs). Within the City limits, there are approximately 361 USTs of varying capacity at 110 street addresses. The approximate total capacity of USTs in the City is over 1,800,000 gallons which is currently being used to store gasoline, diesel, used oil, heating oil, and other substances. Due to the fact that the City is a major commercial and transportation corridor, the City has a relatively high concentration of USTs for its land area. Underground storage tanks are concentrated along the City's commercial and industrial corridors including lower Pickett Road, Old Town Fairfax, the Kamp Washington area, the intersection of Chain Bridge Road and Lee Highway, and the Fairfax Circle area.

When properly maintained, underground storage tanks are safe, save space, and are a more aesthetically pleasing alternative than above ground storage tanks. However, despite recent advances in UST technology, the Virginia Water Quality Assessment for 1992 states that underground storage tanks are the primary source of groundwater contamination in Virginia. Leaking USTs also have the potential to affect surface waters since many streams are fed by groundwater aquifers. Underground storage tanks often pose a greater threat than other sources of pollution because a leak or spill may not be detected until it has already created extensive damage. Further, there exist many underground storage tanks which were installed before more stringent regulations were applied. The location and condition of these tanks are often unknown.

As of January, 1995, there were 51 open cases regarding leaking underground storage tanks (LUSTs) in the City of Fairfax (see Map 9). Since the 1980's the City has had a total of 93 LUST investigations. Other open cases exist outside the City in neighboring Fairfax County; however, the topography of the City would suggest that a leak within the City would be more likely to affect Fairfax County than vice versa. Not surprisingly, LUST sites within the City correlate with areas of existing high UST concentrations. There are no areas within the City which appear to exhibit a particularly high incidence of LUSTs based on density. However, a few areas which have been redeveloped and no longer have active USTs are shown as having particularly high remediation rates. This means that during the process of redevelopment, it was necessary to excavate abandoned USTs.

Another important factor affecting the incidence of leaking tanks is the age of the tanks. Particularly in an area such as Fairfax where soils tend to be acid, older tanks are more likely to be subject to leakage than newer tanks designed to counter acid soil. Areas where age may be a factor are scattered throughout the City and this fact should be a consideration when targeting areas for further investigation or for public/business education. (see Map 10.) Another factor to consider is the proximity of USTs to stream sites. Streams which are located near USTs of above average age may be at particular risk to contamination. Most of the commercial areas of the City directly impact on at least one perennial stream.

The City has and will continue to work with the owners of leaking underground storage tanks and the State Department of Environmental Quality to ensure that any existing or future contamination is properly addressed and corrected.

4.6. Above Ground Storage Tanks

Above ground storage tanks are regulated by the federal government through the Clean Water Act. 40 CFR Part 112 requires owners of single tanks with a capacity greater than 660 gallons or multiple tanks with an aggregate capacity greater than 1,320 gallons to register and formulate a "Spill Prevention Control and Countermeasure Plan." The Commonwealth of Virginia, which regulates above ground storage tanks through the DEQ, Water Division, has adopted requirements for tank owners to present an "Oil Discharge Contingency Plan" (ODCP) before a storage tank may be registered. The purpose of an ODCP is to have a plan of action in the event of a catastrophic release of oil from the largest tank. The Fairfax Tank Farm Complex (located on Colonial Avenue), which is the site of several large above ground storage tanks (the largest of which has a maximum capacity of 32,795,000 gallons), is regulated through the DEQ's program.

Individual tanks with a capacity of less than 660 gallons or multiple tanks with an aggregate capacity of less than 1,320 gallons are not currently regulated by the State or the federal government. Most home fuel oil tanks are typically only 200 to 660 gallons. It is therefore the responsibility of the individual owner to ensure that leaks and spills do not occur. According to the 1990 federal census, slightly less than 19 percent (1,379 of 7,362 occupied housing units) of City households rely on fuel oil or kerosene, often stored in above ground storage tanks, for their primary source of heat. This is a comparatively high concentration of above ground storage tanks compared to other local jurisdictions including the City of Manassas Park (0.4%), the City of Manassas (3%), the City of Falls Church (8%), Fairfax County (8%), the City of Alexandria (9%), and Arlington County (13%). While individual household tanks do not pose a significant risk to the environment, the aggregate of tanks may pose a serious threat if small problems are not taken seriously. According to the DEQ, approximately 90 percent of releases from individual tanks are a result of overfill or the tipping over of the tank. To reduce the risk of accidental spill, the homeowner or fuel company should inspect a tank before filling to ensure that it is sturdy and does not exhibit signs of corrosion. An owner should also have the capacity of the tank clearly marked on the tank and specifically indicate the filling cap location.

4.7. Illegal Dumping of Petroleum and Litter

The reported presence of petroleum products in City streams is a major water quality concern. Petroleum can severely damage the ecosystem by destroying plant life and killing aquatic lifeforms. While some petroleum products in the water may be attributable to leaking automobiles on nearby parking areas or leaking underground storage tanks, the most common source of petroleum is illegal dumping by do-it-yourself (DIY) automotive maintenance activities. A DIY is an individual who removes used oil from a motor vehicle, utility engine, or other piece of equipment that he or she operates as opposed to someone who takes the equipment to a lube shop or auto-mechanic.

There are roughly 50 million Americans who change oil from their own vehicles. While lube shops and auto-mechanics are strictly regulated by the State and federal government,

Map APA-9

Average Age of Underground Storage Tanks Versus Density

Map APA-10

Incidences of Leaking Underground Storage Tanks Versus Density

it is estimated that between 193 and 400 million gallons of used oil are released by DIYers (through pouring the oil down a stormdrain or throwing the oil out) into the environment each year. For areas such as the City of Fairfax, where streams are primarily fed by residential stormdrains, only a few careless instances can result in a significant degradation in water quality.

The City provides and advertises for the collection of used petroleum products at its Automotive Maintenance Shop. The City may wish to consider the implementation of a public education program which not only informs residents what to do with used oil, but also tells them what to do if he/she witnesses a neighbor pouring oil down a storm drain. Another strategy used in neighboring jurisdictions is stenciling stormdrains to warn residents not to dump because the stormdrain eventually empties into the Chesapeake Bay watershed.

4.8. Pet and Animal Wastes

Water quality monitoring of Accotink Creek by the Fairfax County Health Department (Section 3.3.) indicates that levels of fecal coliforms are considerably higher than what is considered acceptable under the federal Clean Water Act. While there are several potential sources of fecal coliforms, the most likely source is from pet waste, and particularly dog waste, which is not disposed of properly. City paths and walkways along streams (or near stormdrains) provide for public access and scenic areas to walk, run, and bicycle. However, these public areas are also used by some pet owners who leave pet wastes which are then easily transported by the next storm directly into the water course.

As can be seen in the City's water quality results, what was once considered merely an aesthetic nuisance, can severely impact on the viability of the City's water resources. Control mechanisms include enforcing local animal waste control provisions, BMPs, and natural stream buffers. While BMPs and natural buffers are being established as part of the City's overall Chesapeake Bay Program, the most effective manner of control is through public education and better enforcement of the City's animal waste control regulation. Better enforcement and education can reduce the levels of fecal coliforms and nutrients in stormwater runoff.

4.9. Air Quality as it Relates to Water Quality

Recent evidence suggests that atmospheric deposition, as a result of poor air quality, has a greater impact on water quality than previously assumed. Studies have shown that airborne deposition of pollutants directly on water bodies and on impervious surfaces (where they are subsequently flushed into watercourses by runoff) may contribute up to 40 percent of the Chesapeake Bay's nitrogen loadings. Nitrogen is the primary pollutant of concern for brackish waterbodies such as the Chesapeake Bay. While very little atmospheric deposition will fall directly into the City's streams, pollutants deposited on impervious surfaces, which make up over 45% of the City, will be washed into local waterways via curbs, gutters, and stormdrains during storm events. This has the potential to contribute significantly to water quality problems within the City and beyond. The passage of the federal Clean Air Act Amendments of 1990 is requiring significant changes in air quality planning and implementation at local, State, and regional levels. The legislation, which encompasses a broad range of planning and regulatory requirements, mandates specific emissions control measures and sets a target date of 1999 for the attainment of ozone health standards in the Washington metropolitan region. Northern Virginia is currently considered a "serious non-attainment" area for ozone.

In the Washington area, the generation of ozone and carbon monoxide is largely attributable to mobile sources and in particular to the use of automobiles. The City of Fairfax and other jurisdictions in the region will be required to implement enhanced vehicle emission inspection programs and use special fuels during the winter to reduce carbon monoxide.

The City of Fairfax has already contributed to improving air quality through the establishment of pedestrian and bicycle trails in accordance with the City's Comprehensive Plan and by keeping Cue Bus fares low to encourage ridership. The City also continues to work with George Mason University and Fairfax County to encourage alternative forms of transportation.

Many approaches to improving air quality from mobile source emissions will be implemented at the State and regional levels through transportation control measures such as increased public transportation and high occupancy vehicle lanes. Technological advances such as reformulated fuels, vapor-catching fuel dispensing systems, and tighter tailpipe standards are other measures whose widespread application is expected. The City of Fairfax continues to contribute to these regional efforts through participation on the Metropolitan Washington Council of Government's Air Quality Committee.

The City of Fairfax seeks to continue its commitment to clean air by expanding its efforts and adopting policies to increase public awareness of the environmental problems associated with increased ozone and carbon monoxide levels. The City's 2020 Commission Report outlines many opportunities for the City to directly improve air quality in the region.

5. Environmentally Sensitive Features and Constraints on Development

Land use planning that takes into account sensitive natural features and water resources has the dual benefit of enhancing quality of life through protecting the environment from degradation as well as protecting businesses and homeowners from potentially harmful environmental hazards. Although land use patterns within much of the City are well established, a few vacant parcels still have development potential. These properties deserve special consideration and should be developed in a manner which integrates the man-made and natural environments.

Most development within the City, however, will take place as a result of redevelopment. Development prior to the late 1980s took place without the benefit of many environmental protection constraints; therefore some existing development is not sensitive to the potential for water quality degradation that development brings. With recent concern raised over environmental degradation, and particularly the effects of increased stormwater runoff on the City's streams, the City has begun to reevaluate past practices. Good planning now prescribes that when possible, development should avoid sensitive environmental features. The following section provides an overview of the sensitive natural resources within the City of Fairfax and an analysis of how these resources are currently being managed and additional management options.

5.1. Floodplains

The relatively flat or low land area adjoining a river, stream, or water course which is subject to partial or complete inundation is known as a floodplain. Encroachment on floodplains, such as artificial fill, reduces a stream's flood-carrying capacity, increases flood heights, and increases flood hazards in areas beyond the encroachment itself. In addition, floodplain soils are often unsuitable for development due to high water table, shrink-swell potential, and highly permeable and hydric soil conditions. Floodplains also provide important habitat for a range of vegetative and animal species. In 1974, the Federal Emergency Management Agency (FEMA) conducted a study of flooding potential and hazards in the City of Fairfax as part of its national flood insurance program. The plan was also meant to be used as a tool to assist local governments in effective floodplain management. As a result of the study, the City adopted a Floodplain regulation which establishes an overlay as part of the Zoning Ordinance. The current Floodplain regulation was adopted by the City in 1993. The overlay district severely limits the type and location of any development in the floodplain district. The floodplain district includes areas subject to inundation by waters of the one-hundred-year flood.

The one-hundred year floodplain within the City is associated with areas along the north and central forks of Accotink Creek, Daniels Run, and some major tributaries. In addition to the provisions of the Floodplain regulation, the one-hundred year floodplain is a key component of the City's Chesapeake Bay Protection Area Overlay District and is designated as a Resource Management Area. This designation is in recognition that a vegetated floodplain buffer provides significant water quality benefits and serves to protect and enhance the water quality benefits provided by the City's Resource Protection Areas. Conversely, a denuded or improperly developed floodplain can result in erosion and a significant reduction in water quality and reduce the effectiveness of the RPA. Map 3 delineates the approximate extent of the one-hundred year floodplain in the City.

5.2. Geologic and Sensitive Soil Conditions

It is difficult to overemphasize the importance of geology and soils characteristics when planning for new development and redevelopment. Development should be guided away from sensitive or unstable areas in order to protect the safety of residents, the structural soundness of buildings, and the water quality of Accotink Creek, Pohick Creek, Pope's Head Creek, Difficult Run, and eventually the Potomac River and the Chesapeake Bay.

The City's Chesapeake Bay Preservation regulation designates areas with highly permeable or highly erodible soils as Resource Management Areas. Other common constraints placed by geologic conditions or sensitive soils include but are not limited to hydric conditions, shrink-swell potential, wetness, flooding potential, depth to bedrock, and high water table. Proper management of soils will help maintain clean water and will provide areas to recharge groundwater. However, poor management of soils will choke local waterways with silt and sediments and result in the erosion of valuable topsoil as well as spoil the landscape.

According to the Soil Survey of Fairfax County, Virginia (1963), most of the City falls into the Fairfax-Beltsville-Glenelg and the Glenelg-Elioak-Manor soil associations. Most of the soils in the Fairfax-Beltsville-Glenelg association are well suited as material for home sites. With some exceptions, the soils of the Glenelg-Elioak-Manor association are also well suited for urban development purposes. Much of the land within the City's floodplain falls into the Chewacla-Wehadkee association. These soils are poorly drained, subject to flooding, and not suitable for urban development.

A fourth association, the Orange-Bremo-Elbert, is found in the western portion of the City near Jermantown Road. Soils in the Orange series, which comprise 65% of the association, are poorly drained with massive bedrock 2 to 5 feet below the surface. Because of the high shrink swell potential and beds of hard rock found close to the surface, the construction of

Map APA-11

Geology and General Soils Maps of the City of Fairfax

buildings and improvements on these soils is unusually difficult. The Soil Survey of Fairfax County, Virginia notes that the Orange soils are among the poorest materials in the County for housing developments. Another feature of the Orange series is the presence of asbestos. The asbestos is found in several forms, including the fibrous form which, when airborne, can cause lung diseases. The presence of asbestos fibers in the air during construction can be a hazard to construction workers. This problem is mitigated with the replacement of topsoil following construction.

The underlying geology of the City, which along with climate determines soils characteristics, offers both constraints and opportunities for development. In order to promote soil conservation and protect water quality, as well as safeguard residents and businesses from potential hazards, including hazards such as radon, it is imperative that future development within the City takes geologic constraints into consideration. With the exception of areas underlain by mafic rocks in the western portion of the City and floodplains, most areas of the City are generally suitable for development purposes if a site is properly engineered. A discussion of the engineering capacity of underlying geology is inappropriate for this Plan due to its technical and detailed nature. Developers must refer to the City's Department of Public Works for more information and recommended resources.

5.3. Vegetative Buffers and Areas with Mature Tree Canopy Cover

To the maximum extent possible, the City wishes to maintain and enhance its urban tree cover. During development, provisions must be made to protect existing trees and replace trees when they are damaged or removed.

The City's Chesapeake Bay Preservation regulation also requires that a 100-foot buffer area along perennial streams be maintained or established during development or redevelopment in order to protect streams from the adverse affects of increased impervious surfaces and resultant runoff.

Since the City is almost entirely developed, few significant vegetation stands remain. Those that still exist deserve special protection so that their aesthetic and ecological benefits to the City are not lost. The largest City-owned vegetation stand is located at Daniels Run Park. The park covers 48 acres, most of which is in a natural state. It contains deciduous vegetation with an oak canopy and a beech understory. Other tree types found there are hickory, sycamore, tulip poplar, and holly. The 20-acre Van Dyck Park is partially wooded as is the 18-acre Ranger Road Park. The 17-acre Providence Park is almost entirely wooded, and contains many of these same tree types. Two large privately owned tracts of land in the City are heavily wooded. The 80-acre Farr tract, located between Old Lee Highway and Main Street, is mostly undeveloped and heavily wooded.

Four trees located in the City have been designated as noteworthy in a program sponsored jointly by the National Arborist Association and the International Society of Arborculture. The most important is a 245-year old White Oak on Brookwood Street. Other noteworthy trees include a 150-year-old Red Oak on Springlake Terrace, a 118-year-old Red Maple on Autumn Court and a 171-year-old Southern Red Oak on Randolph Street.

The City's concern for trees is reflected in its Arbor Day tree planting activities and its designation every year starting in 1987 as a Tree City by the National Arbor Day Foundation.

5.4. Non-Tidal Wetlands

Wetlands provide a variety of environmental and socio-economical benefits and also serve as important fish and wildlife habitat. Wetlands enhance water quality by filtering water as it passes through, thereby reducing sediments, nutrients, and chemical and organic pollutants flowing to open water. Wetlands also assist with flood control and serve as groundwater discharge and recharge areas. Thirty-five percent of all animals on the federal list of rare and endangered species depend heavily on wetlands for food and shelter.

Pertinent law protecting non-tidal wetlands includes Section 404 of the federal Clean Water Act, which addresses dredge and fill operations and is administered through the Army Corps of Engineers, and the Virginia Water Protection Permit Act. Other programs, such as those under the Virginia Endangered Species Act and various floodplain management regulations, also serve to protect non-tidal wetlands.

Under the City's Chesapeake Bay Preservation regulation, non-tidal wetlands connected by surface flow and contiguous to tributary streams are designated as RPAs. All other non-tidal wetlands are protected as RMA features. Most wetlands within the City are located contiguous to a tributary stream and within the confines of the floodplain, which in most instances represents the furthest extent of the City's RMAs.

Wetlands in the City of Fairfax are concentrated in the floodplains of the tributaries of the City and are primarily classified as PFO1A (palustrine, forested wetland, broad-leafed deciduous, non-tidal temporarily flooded), POWZ (palustrine, open water/unknown bottom, permanently flooded), and PEME (palustrine, emergent wetland, and seasonally flooded saturated). The term palustrine refers to all non-tidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens. It also includes areas lacking vegetation that have water depth of less than two meters at low water in the deepest part of the basin.

5.5. Topography

Poorly designed and constructed developments on steep slopes frequently result in substantial costs to the public, either for repairs or for protective measures to prevent further damage. Increased runoff and sedimentation from denuded hillsides require increased public expenditures for flood control and stormwater management. Further, improperly planned development of hillsides affects the equilibrium of vegetation, geology, slope, and soil. While the City of Fairfax is largely built out, any redevelopment within the City must take topographic constraints into consideration for the following reasons:

- Disturbance of hillsides can result in soil instability and increased erosion.
- Disturbances of hillside can increase runoff.
- Disturbance of hillsides can destroy a community's aesthetic resources.

Steep slopes in excess of 15 percent and slopes located along streams are susceptible to erosion and, therefore, particular care must be taken when planning to develop a site with this characteristic. In some instances, special engineering may be required to stabilize slopes. Steep slopes over 15% are protected as Resource Management Areas under the City's Chesapeake Bay Protection regulation.

Only a very small portion of the City's land area has slopes of over 15%. These areas are primarily associated with reaches of Accotink Creek and Daniels Run and lie within the City-owned Van Dyck and Daniels Run Parks and in the Army Navy Country Club Property.

5.6. Groundwater Protection

The importance of groundwater protection was recognized by the Commonwealth of Virginia when the General Assembly enacted the Groundwater Act of 1973 and the Groundwater Management Act of 1992. The Groundwater Management Act reads "... unrestricted usage of groundwater is contributing and will contribute to pollution and shortage of groundwater, thereby jeopardizing the public welfare, safety, and health."

Although the City now receives a treated water supply from the Goose Creek Reservoir in Loudoun County, protection of the City's groundwater must be a consideration during development and redevelopment. When development occurs, it affects the natural balance of the groundwater flow. Increased imperviousness as a result of development reduces the potential for groundwater recharge and should be taken into consideration when designing a site plan. Generally, high topographic areas are groundwater recharge areas and impervious surface areas in defined groundwater recharge areas should be minimized. By providing recharge areas for stormwater, groundwater equilibrium can be maintained. If recharge areas are not taken into consideration, wells may go dry, base flow to streams is reduced, and wetlands may shrink.

Once contaminated, the usefulness of an aquifer as a resource may be limited or destroyed depending on the toxicity of the contamination and the effort, time, and money involved in clean-up. In most cases it is impractical and sometimes impossible to restore a contaminated aquifer to its original level of purity. Common sources of groundwater contamination include but are not limited to leaking underground storage tanks, antiquated sewer lines, septic systems situated on improper soils, and improperly capped wells. In addition, improperly maintained water quality best management practices may present a groundwater threat. In the City of Fairfax, the most common source of groundwater contamination on record with the Department of Environmental Quality, Water Division, is from petroleum leaks and spills. More stringent underground tank standards enacted in recent years should reduce the level of contamination from these sources.

Careful site planning will decrease the potential for groundwater poleneral, the potential for groundwater pollution in the Piedmont is less than that of the Coastal Plain to the east and the Triassic Basin to the west. The potential for groundwater contamination near streams is heightened due to high water table and soils characteristics.

6. Chesapeake Bay Program Implementation and Options for Futher Program Development

During much of 1989 and 1990, City staff worked with the Chesapeake Bay Local Assistance Department (CBLAD) in order establish a Chesapeake Bay program which would comply with elements A (a map delineating Chesapeake Bay Preservation Areas) and B (performance criteria applying in Chesapeake Bay Preservation Areas) of the Chesapeake Bay Preservation Area Designation and Management Regulations. After an extensive review process, the City of Fairfax Council adopted a Chesapeake Bay Preservation regulation as part of its Zoning Ordinance on October 9, 1990. Although there remained some issues of concern between the City and the Chesapeake Bay Local Assistance Board (CBLAB), because of the City's good faith effort, the City's program was found provisionally consistent Since that time, the City's Department of Planning and Department of Public Works have cooperatively implemented the provisions of the City of Fairfax Chesapeake Bay Preservation regulation.

As a requirement of provisional consistency, CBLAB resolved (1) that suggested program modifications be completed as expeditiously as possible, and (2) that the City revisit its RMA designation in conjunction with review and revision to the City's Comprehensive Plan.

The purpose of this section is to reinvestigate the City's Chesapeake Bay Program and to assess whether the current

program will adequately address the City's long-term water quality concerns.

6.1 Program and Regulation Modifications

In its review of the City's adopted Chesapeake Bay Preservation regulation, CBLAD made several recommendations in order for the City's program to become fully consistent with State regulations. Recommended regulation changes include the following:

1. Amend the ordinance to remove the single family home exemption for the erosion and sediment control provisions.
2. Amend the ordinance to delete the reference to the City's erosion and sediment control provision for public utility transmission lines, railroads, and public roads.
3. Amend the ordinance to require a soil and water conservation plan for all agricultural uses in Chesapeake Bay Preservation Areas.
4. Amend the ordinance to require a minimum 50 foot buffer with appropriate best management practices.
5. Amend the ordinance to require compliance with the performance criteria in §26-19.1(a) for passive recreation.

6.2. Revisiting the City's RMA Designation

The City designates floodplains, highly erodible soils, highly permeable soils, non-tidal wetlands not included in Resource Protection Areas, and steep slopes in excess of 15% as Resource Management Areas protected under the City's Chesapeake Bay Preservation regulation. Because published soils information for the City is only general in nature and does not indicate specific areas of highly erodible or permeable soils or steep slopes, the prevailing mapped RMA is the floodplain. Two concerns are raised by the City's limited RMA designation. First, does the designation adequately protect the City's RPAs so that they may perform their intrinsic water quality functions. Second, does the RMA as designated encompasses a land area large enough to employ the performance criteria in Section 4.2. of the Chesapeake Bay Preservation Area Designation and Management Regulations which are designed to improve the City's ability to protect water quality.

Protecting the City's RPAs — The answer to whether the extent of the RMA designation is adequate to protect the RPA appears to be ambiguous. As noted by CBLAD in its staff report, the floodplain in many areas extends some 300 to 400 feet. In these instances, the floodplain provides adequate protection to the RPA. However, in other areas, the extent of the floodplain is less than 100 feet and does not even fully cover the extent of the RPA. As written, the City's Chesapeake Bay Preservation regulations do not provide adequate protection to designated RPAs.

While the regulation proper does not address this discrepancy, CBLAD notes that the City's official CBPA map appears to indicate that in areas where the floodplain does not provide a RMA of at least 100 feet from designated RPA features, that a minimum 100 feet RMA is established. While this 100 foot RMA is sufficient to protect designated RPA features, it is the regulation, and not the map which carries the force of law. Therefore, the RMA definition in the regulation should be amended to include a minimum 100 foot RMA adjacent to the RPA where defined RMAs are insufficient.

Expanding the City's RMAs — Assuming the expansion of the definition of the City's RMA in the preceding section, the City's Chesapeake Bay Preservation Areas (CBPAs) cover approximately 11.8% of the City's land area. New development which would be subject to the City's regulation is defined by vacant or underdeveloped property. Sizeable areas of vacant land are scarce in the City of Fairfax. All total, there is approximately 245 acres of vacant land in the City (about 6% of the land area). Of that amount, 165 acres would be subject to the City's Chesapeake Bay Preservation regulation. Of the 165 acres within the CBPA, only approximately 86 acres maximum could be developed due to floodplains and other constraints. This represents only 2% of the entire City area. Much of this 2% is contained within undeveloped portions of the Farr Homestead Tract.

Most of the potential for water quality improvement will therefore come as a result of redevelopment and the implementation of source control programs. Therefore, the extent to which the RMA designation covers areas targeted for redevelopment largely determines whether significant water quality protection will be recognized. An analysis of City parcel maps shows that the largest area covered by the expanded RMA designation (from the preceding section) is for single family homes not slated to be redeveloped. Several areas of commercial land use, however, are targeted for potential redevelopment. Map 12 shows targeted redevelopment nodes for the City. A total of 11% of the City is targeted for redevelopment. Areas slated for redevelopment within the City are highly impervious in nature and were generally built before stormwater quality measures were required.

However, the current RMA designation will likely not achieve a significant gain in water quality since most of these areas targeted for redevelopment are not within the CBPA. In its present form, the City's RMA designation serves to cover only 14% of those areas which are targeted for redevelopment. In addition, there is no new CBPA. The potential for implementation of the City's program is, therefore, severely limited. Further, the great majority of the area affected by the RMA designation which is not park land are single family homes which are not slated for any type of redevelopment. Any improvement in water quality would almost be solely dependent on pollution prevention programs.

While the City recognizes water quality protection as an important goal, it is limited in its approaches due to the lack of available natural resources mapping materials. CBLAB has adopted policies to address situations where existing mapping resources are inadequate to designate appropriate RMAs. The policy states "localities with no mapping resources or with mapping resources for only portions of their jurisdictions should evaluate the relationships of the following land categories to water quality protection in making their RMA designations. The department will consider the degree to which these land categories are included when evaluating the consistency of a locality's RMA designation for achievement of significant water quality protection:

1. Known RMA land types;
2. Developable land within the jurisdiction;
3. Areas targeted for redevelopment; and
4. Areas served by pipe drainage systems which provide no treatment of stormwater discharges."

Options to increase the effectiveness of the City's RMA should be measured largely by their potential to include redevelopment within the City's Chesapeake Bay Program. The following options were included for further analysis.

1. Expand the City's RMA to include the entire parcel or development site.

   Under the Chesapeake Bay Designation and Management Regulations, the City may establish that if any portion of a parcel, lot, or development project is within the designated RMA, then the entire property is subject to that designation. Whole lot compliance also makes sense from an administrative perspective – instead of applying two sets of standards to one lot, one set is applied to the entire lot.

2. Expand the definition of the City's RMA to cover areas slated for redevelopment.

   According to Section 2.C. of CBLAB's Board Determination of Consistency Regarding Local Designation of RMA, areas which have little or no RMA land types shown by available mapping resources may include major areas of "vacant, developable land and land targeted for redevelopment. Even if such areas are somewhat removed from the shoreline, they may have a water quality impact on receiving waters similar to shoreline lands due to the direct stormdrain connection." Therefore, one option is for the City to expand its RMA designation to include those areas of the City officially identified as targeted for redevelopment in the Comprehensive Plan.

   Such a designation would ensure that all areas where significant water quality protection could be achieved through redevelopment would be covered. Coupled with the implementation of the whole lot RMA option, significant portions of developable vacant land within the City would be covered.

3. Institute jurisdiction-wide RMA.

   The City maintains the option to designate the entire City as a RMA. This designation is justifiable since the City does not know the actual extent of its natural RMA features and because most of the City is served by stormsewer which directly discharges to local streams.

   Many Northern Virginia jurisdictions that have implemented this type of approach have included an opt out clause if the developer can show that there are no identified RMA features on the development site.

   The designation of the entire City as an RMA would also aid in regional coordination of Chesapeake Bay initiatives since surrounding Fairfax County has designated itself as a jurisdiction-wide RMA. However, the jurisdiction-wide designation would place a greater administrative burden on the City since all sites would have to be reviewed for consistency with the City's Chesapeake Bay regulation.

4. Employ specific general performance criteria of the Chesapeake Bay Preservation regulation jurisdiction-wide.

   In lieu of jurisdiction-wide RMA, the City may apply certain general performance criteria of the Chesapeake Bay Preservation regulation jurisdiction-wide. The two general performance criteria most directly relating maintaining and improving water quality during redevelopment are the application of erosion and sediment control to all land disturbing activities that exceed 2,500 square feet and the application of stormwater quality requirements of the City's Chesapeake Bay Preservation regulation. The stormwater quality provision requires no net increase in nutrient loadings as a result of new development (based on a jurisdiction-wide imperviousness rate) and a 10% reduction in nutrients during redevelopment (based on previous site conditions). From an administrative standpoint it is easier to implement these performance criteria as opposed to implementing jurisdiction-wide RMA. Under this option, all instances of development and redevelopment would be covered for water quality purposes.

An analysis based on City parcel maps shows that under the whole lot RMA designation the City's RMA would expand to encompass over 30.8% of the land area. The percentage of areas targeted for redevelopment covered by the CBPA increases to slightly more than 35% (Map 12).

While implementation of options (2.) and (3.) would effectively ensure that all development and redevelopment within the City had the potential to result in water quality

improvement, the options do not make a distinction between those lands which are identified as intrinsically valuable and the general need to protect water quality. The City wishes to maintain this distinction. Under option (2.) it would be difficult and perhaps inequitable to expand the RMA to only areas targeted for redevelopment. Option (2.) also does not maintain the flexibility necessary as unanticipated redevelopment occurs or as targeted areas for redevelopment change. The additional administrative burden of options (2.) and (3.) would be significant.

Option (4.) allows for the City to achieve water quality protection while recognizing the special value of the City's RMAs. It would be significantly easier to administrate since no Water Quality Impact Analysis would be required. Rather, a simple computation of pre- and post-nutrient loadings would be required. Many new developments would not be required to implement structural techniques given the City's already high imperviousness rate and many redevelopments would be able to satisfy these requirements through the restoration of pervious surface.

A combination of option (1.) and (4.) will achieve the highest degree of water quality protection while minimizing the administrative burden of the City and the burden on the developer. Distribution of burden would also be more equitably distributed.

In its present form, the City's Chesapeake Bay Preservation regulation does not allow commercial development within the RMA. Further, the City mandates that during redevelopment that at least 20% of the area be left in open space. If the City were to adopt the whole lot RMA option, it should amend its regulation to allow commercial uses and should dispense with the 20% open space requirement in order to maintain a desired intensity of uses within commercial nodes.

Map APA-12

Chesapeake Bay Preservation Areas Applied to Entire Parcels and Areas Targeted for Redevelopment

Recommendations

The City of Fairfax recognizes the importance of the Bay as an economic and social resource and is committed to its protection through the implementation of the Chesapeake Bay Preservation Area Designation and Management Regulations. The following provides the background information and analysis necessary for the City to arrive at informed and proactive policies and goals which address the issue of water quality protection in City streams and the Chesapeake Bay. These recommendations approach water quality protection from the viewpoint that water quality protection and healthy economic development are not mutually exclusive, but rather that both may be accomplished simultaneously and that the result is a better quality of life for all residents of the City.

Recommendation 1: Protect the quality of the City's surface water resources, the Potomac Estuary, and the Chesapeake Bay from the avoidable impacts of land development.

- *Enforce and strengthen the provisions of the City's Chesapeake Bay Preservation regulation.*

  The City's Chesapeake Bay Preservation regulation is the City's primary water quality protection tool. Based on comments from the states' Chesapeake Bay Local Assistance Board, several amendments should be made to the City's regulation to bring it into compliance with State law and to make it more administratively efficient.

  These include: (1) amend § 26-18.2 so that if the boundaries of an RMA include a portion of a lot, parcel, or development project, the entire lot, parcel, or development project is considered to an RMA; (2) amend the definition of a RMA in § 26-18.1 to include provisions that where the defined RMA does not exist more than 100 feet upland of the RPA, a 100 foot RMA is designated as sufficient protection of water quality; and (3) amend the regulation in accordance with CBLAB's provisional consistency requirements.

  Analysis of currently designated Chesapeake Bay Preservation Areas suggests that they will not result in the regulation's application during many redevelopment projects where there is the opportunity to improve local water quality. To ensure that all redevelopment results in an increase in water quality, the stormwater requirement of § 26-19.1(7) of the Chesapeake Bay Preservation regulation should be applied to the entire City.

- *Enforce and strengthen the City's Erosion and Sediment Control Ordinance.*

  The Erosion and Sediment Control Ordinance serves to protect City streams during site development by minimizing erosion and sedimentation.

- *Amend as necessary the City's regulations relating to water quality to ensure that the City's Chesapeake Bay Program is mutually supportive.*

  Review the City's water quality regulations (Erosion and Sediment Control, Zoning, and Subdivision) and produce recommendations for their amendment, if necessary, to come into consistency with Bay Act regulations.

- *Maintain strong City oversight of private BMP maintenance programs.*

  Review the effectiveness of the city's current BMP maintenance program and determine whether stronger inspection and maintenance measures are required. Make recommendations for how to improve the City's maintenance program, if necessary.

- *Identify and protect environmentally significant stream corridors. Preserve these in a natural state when possible and restore native vegetation to denuded streamside areas to promote stream quality.*

  During development and redevelopment, the City's Chesapeake Bay Preservation regulation requires that a vegetative Buffer Area of 100 feet must be established where none exists and preserved where present along perennial streams. The City should take steps to identify other environmentally significant stream corridors worthy of preservation or restoration. The City should also takesteps to restore denuded stream areas on public property through private citizens groups, City programs, or through grant opportunities. The NVPDC Piedmont Vegetative Practices Handbook may be used as a technical reference.

- *Ensure that development avoids where possible, or minimizes disturbance of sensitive environmental features, including problem soils.*

  Improper development of sensitive environmental features, and particularly soils, may result not only in structural damage to buildings, but also to a loss of soil to erosion, a decrease in local water quality, and the loss of important habitat and aesthetic resources.

- *Improve the City's ability to identify sensitive environmental features.*

  Readily available information concerning environmentally sensitive features will help the City to better plan for and avoid the negative environmental impacts resulting from land disturbing activities. The development and redevelopment processes often result in the generation of substantial information on environmental features. During the development process. The City should take the opportunity to collect information, generated from site plans, reports, etc. on sensitive environmental areas, and particularly on soils.

The City should arrange a protocol to compile this information to create an overlay map identifying environmentally sensitive features within the City including steep slopes, soils, wetlands, floodplains, undisturbed natural areas, and features which are unique or integral to the character of the City.

Recommendation 2: Ensure the adequacy of the City's future stormwater management system while emphasizing the need to protect tributary streams and water quality.

- *Implement the recommendations of the 1992 Stormwater Systems Capital Needs Study.*

  The Stormwater Systems Capital Needs Study identifies strategies for improving the capacity of the City's stormwater system to handle increased stormwater runoff as a result of increased impervious surfaces within the City. Recommendations are also made for improving the quality of the City's surface waters including streambank stabilization and the establishment of structural water quantity/quality control facilities.

  The City should examine the potential for incorporating water quality measures into any proposed retrofit of existing stormwater management facilities or construction of new stormwater management facilities during the implementation of the Stormwater Systems Capital Needs Study. In addition, where possible, streambank stabilization should be accomplished through restoration of riparian areas. Wide spread use of structural measures to control stream bank erosion is discouraged.

- *Minimize exposure of the City's natural floodplains to new development.*

  Natural floodplains are essential to the conveyance of stormwater in that they provide extra holding capacity during storm events. Construction on floodplains places the property owner at risk and diminishes the capacity of the floodplain, thus exacerbating flooding in downstream areas. In addition, floodplains left in their natural condition form a filter for polluted runoff from surrounding land uses. Protection of the City's floodplain is achieved through enforcement of the City's Floodplain regulation.

- *Encourage the use of shared, or regional stormwater control measures during development and redevelopment.*

  The implementation of a large number of small, site-specific stormwater quality/quantity management facilities increases maintenance costs and consumes large quantities of valuable land. The City should seek to facilitate cooperative agreements among developers to encourage the establishment of regional stormwater management facilities.

Recommendation 3: Reduce existing sources and prevent potential sources of point and nonpoint source pollution resulting from residential, commercial, and industrial activities within the City.

- *Continue to expand the City's long-term environmental monitoring program.*

  Investigate and make recommendations on how the current monitoring program conducted by the Fairfax County Health Department can be utilized to better pinpoint sources of pollution within the City.

  Foster the use of citizens groups to monitor stream quality and collect water quality and stream health data.

- *Continue efforts to improve the region's air quality.*

  The City should continue to pursue measures to improve air quality through support of pedestrian access and mass transportation. The City's 2020 Commission Report outlines a number of local initiatives which have been undertaken by the City to improve air quality. Since air quality is regional concern, continued participation on the Metropolitan Washington Air Quality Council is necessary to achieve many air quality goals.

- *Improve the City's ability to respond to the potential hazards of leaking underground and above ground storage tanks and pipelines.*

  The City should continue to work closely with the Department of Environmental Quality, Water Division, to monitor and enforce clean-up of underground storage tanks.

  The City should support programs to educate residents on how to safely manage above ground storage tanks and should promote policies aimed at providing opportunities to reduce reliance on above ground storage tanks through conversion to alternative forms of fuel.

- *Reduce fecal coliform contamination and related nutrient loadings in City streams.*

  Fecal coliform is the pollutant of greatest concern in City streams and poses a potentially serious public health threat. Fecal coliforms, which indicate the presence of fecal matter, also indicates increased nutrient loadings to City streams. While the City has animal waste control regulations, more stringent enforcement, along with rigorous public education, are needed to reduce this threat to the public health and the environment.

  Fecal coliform can also be the result of a leaky sanitary sewer system. While a leaky sanitary sewer system results in increased treatment costs to the City as stormwater infiltrates into the line, it can also result in the discharge of pollution to local streams and groundwater. As noted in

the City's Stormwater Systems Capital Needs Study, several sanitary sewer lines are exposed at their crossing with streams, creating the potential for serious leakage. The City's 2020 Commission Report cites that sewer utility rates are markedly higher in wet months, suggesting a leaky sewer line.

The City should include within its Capital Improvement Program funds to find and repair the major source of water infiltration and exfiltration in the sanitary sewer system.

- *Expand the City's integrated pollution prevention program and continue to build upon and strengthen the City's already strong water conservation program.*

  The City has established a number of successful public education programs geared at preventing pollution at its source. These efforts should be expanded to include both citizen and business education.

  Water conservation education measures help to protect water resources from unnecessary depletion and reduce the chances that lawn care practices or car washing will result in water pollution. The City, through the Code Administration Office and the Water and Sewer Office, already has in place a comprehensive water conservation education program. Two measures that will strengthen this program are the the incorporation of water conservation education into the City's school curriculum. The former may take the form of an occasional one-page leaflet highlighting conservation measures and their environmental and money-saving benefits. The City should contact Arlington County regarding their successful school-based water conservation education program.

- *Continue to improve upon the City's strong recycling program.*

  A well publicized recycling program will decrease the level of illegal disposal of materials, and particularly oil, into the City's storm sewer system.

Recommendation 4: Protect the quality of the City's potable water supply and safeguard the City's roundwater resources against contamination which may adversely affect the biological ecosystem.

- *Continue to work with Loudoun County to ensure that the Goose Creek Reservoir is adequately protected.*

  The area around the City's water supply at Goose Creek Reservoir is expected to experience rapid suburbanization in the next few years. The County has developed preliminary plans to protect the Reservoir and the City should seek to remain an active participant in the review process.

- *Work with the Department of Environmental Quality's Water Division to protect groundwater from contamination from underground storage tanks.*

  The primary threat to the City's groundwater is contamination from underground storage tanks. While the City has no legal authority to regulate underground storage tanks, it should work closely with the Department of Environmental Quality's Water Division to identify areas with high contamination potential and to quickly remediate areas where contamination has already occurred.

Recommendation 5: Enforce and strengthen the provisions of the City's Chesapeake Bay Preservation regulation.

- *Apply the Chesapeake Bay Preservation regulations to an entire parcel if a portion of the parcel is within a Chesapeake Bay Preservation Area.*

  The City should amend its Chesapeake Bay Preservation Regulations to say that if the boundaries of a CBPA include a portion of a lot, parcel, or development project, the entire lot, parcel, or development project shall comply with the regulations. Also the division of property shall not constitute an exemption from the regulations.

- *Provide a minimum 100-foot Resource Management Area (RMA) to protect Resource Protection Area (RPA) features.*

  The City should add to the definition of Resource Management under the appropriate City Code Section the following: "Where the above-defined Resource Management Area does not extend at least 100 feet upland of the outward boundary of the Resource Protection Area, a 100 foot RMA is required as the minimum necessary to protect water quality."

- *Bring the City's Chesapeake Bay Preservation Regulations into full consistency with the Chesapeake Preservation Act (as per the April 11, 1991 CBLAD review).*

  The City should amend the appropriate City Code Sections to achieve the following: require any land disturbing activities exceeding 2,500 square feet, including construction of all single family homes, to comply with the requirements of the City's Erosion and Sediment Control regulations.

- *Require Best Management Practices (BMPs) for all development within the City, while avoiding the extension of Water Quality Impact Assessment (WQIA) requirements to these areas.*

  Due to the fact that much of the City is served through stormsewer, which effectively bypasses the water quality benefits of established Buffer Areas, the City should amend the appropriate City Code section to require that Best

Management Practices (BMPs) apply to all lands within the City regardless of whether the property is located within a designated CBPA.

- *Ensure that the extension of Best Management Practices (BMPs) to all areas of the City does not impede the City's ability to maintain dense core commercial areas.*

  The City should delete the appropriate City Code Section that requires the redevelopment of completely impervious sites to restore a minimum of 20 percent of the site to vegetated open space.

- *Remove the restriction on commercial and industrial uses in the RMA given the expansion of the City's functional RMA.*

  The City should amend the appropriate City Code Section by adding the following: "Uses, development, and redevelopment otherwise permitted under Chapter 26 of the Code of the City Fairfax and other law, shall be allowed in RMAs provided that the use, development, or redevelopment is in compliance with the performance criteria set forth in this division."